

Least Bell's Vireo (*Vireo bellii pusillus*)

Legal Status

State: Endangered in California.

Federal: Endangered.

Critical Habitat: Designated
(59 FR 4845–4867)

Recovery Planning: U.S. Fish and Wildlife Service (USFWS) 1998.

Notes: The species Bell's Vireo is also listed as a Bird of Conservation Concern by the USFWS within the Mojave Desert Bird Conservation Regions (BCR) (USFWS 2008).



Photo courtesy of Brock Ortega, Dudek.

Taxonomy

There are four recognized subspecies of Bell's vireo (*Vireo bellii*) including *V. b. bellii*; *V. b. medius*; *V. b. arizonae*; and *V. b. pusillus*, the least Bell's vireo (AOU 1998). While all subspecies are similar in appearance, least Bell's vireo is mostly gray above and pale below, while easternmost birds are greenish above and yellowish below. Southwestern subspecies are intermediate in plumage characteristics. Descriptions of the species' physical characteristics, behavior, and distribution are provided in a variety of field guides (e.g., Peterson 1990; Sibley 2000; National Geographic 2002).

Distribution

General

Bell's vireo is a migratory species that breeds in North America. Least Bell's vireo breeds in central and southern California, and northwestern Baja California. In California, breeding takes place through coastal Santa Barbara County to San Diego County, San Bernardino, Riverside, and Inyo Counties (USFWS 2006). A few isolated least Bell's vireo have been observed in Kern, San Benito, Monterey, and Stanislaus Counties since the species was listed but these counties have not supported any sustained populations.

In California, the historic range of least Bell's vireo has severely contracted. Historically, the breeding range of the least Bell's vireo subspecies was widespread throughout California, including the Sacramento and San Joaquin Valleys (Grinnell and Miller 1944), Sierra Nevada foothills, and in the Coast Ranges from Santa Clara County south to approximately San Fernando, Baja California, Mexico (USFWS 1998). Populations were also known from the Owens Valley, Death Valley, and at scattered oases in the Mojave Desert (Kus et al. 2010; USFWS 1998). At the time of listing in 1986, over 99% of the least Bell's vireo population was found south of Santa Barbara County (USFWS 2006).

The least Bell's vireo subspecies overwinters primarily along southern Baja California (Kus 2002a) while the Arizona Bell's vireo subspecies overwinters primarily in northwestern Mexico (Kus, pers. comm. 2012) (Figure SP-B02).

Breeding habitat for all subspecies of Bell's vireo generally consists of dense, low, shrubby vegetation, (early successional stages) in riparian areas, and mesquite brushlands, often near water in arid regions (Kus et al. 2010). Bell's vireo winter in both riparian and upland vegetation but in habitats more widely distributed away from water. Least Bell's vireo winters in willow riparian habitat, arroyo scrub vegetation and hedgerows in coastal drainages (Kus et al. 2010).

Distribution and Occurrences within the Plan Area

Historical

In California by the early 1980's, least Bell's vireo was extirpated from most of its historic range, with small populations remaining in coastal southern California (U.S. Fish and Wildlife Service 1998). There are four historical (i.e., pre-1990) occurrences of least Bell's vireo in Inyo County in the northern portion of the Plan Area and in the southern portion of the Plan Area in and west of Joshua Tree National Park (Dudek 2013).

There are also three historical occurrences for Bell's vireo where the species occurrence in the database is not identified to subspecies (Dudek 2013). These observations were in the Shadow Valley area west of the Mesquite Mountains, near Shoshone, and near Furnace Creek (Figure SP-B02).

Recent

At the time of its federal listing, least Bell's vireo had been extirpated from most of its historic range, and numbered just 300 pairs statewide (Kus 2002a; USFWS 1998). Due to extensive habitat protection and cowbird control programs, the least Bell's vireo is increasing throughout southern California, with a tenfold increase in the recorded population since its listing in 1986 (USFWS 2006) and a recent colonization of the San Joaquin River in Stanislaus Co. (Howell and Dettling 2009; see Conservation and Management Activities). However, least Bell's vireo has not yet meaningfully recolonized its historical breeding range in the Sacramento valley (USFWS 2006). Breeding pairs have been observed in the Counties of Monterey, San Benito, Inyo, Santa Barbara, San Bernardino, Ventura, Los Angeles, Orange, Riverside, and San Diego, with the highest concentration in San Diego County along the Santa Margarita River (USFWS 2006).

There are 29 recent occurrence records of least Bell's vireo in the Plan Area in the following areas: near Lancaster and Palmdale, north of Hesperia, north of Victorville, southwest of Yucca Valley, along Carrizo Creek in Anza Borrego Desert State Park, and along Owens River (Figure SP-B02) (CDFW 2013; Dudek 2013).

There are 10 recent occurrences for Bell's vireo that are not identified to subspecies in the following areas: two occurrences west of Pearsonville in the southern Sierra foothills, two occurrences in the Amargosa River area, one occurrence south of the Salton Sea, and five occurrences in the Morongo Valley area (Dudek 2013).

Natural History

Habitat Requirements

Bell's vireo is a neotropical migrant that breeds in the summer in riparian scrub (Table 1). Least Bell's vireo is largely associated with early successional cottonwood-willow and is known to nest in riparian woodlands dominated by willow (Kus et al. 2008) and Fremont cottonwood (*Populus fremontii*) (Kus 2002a). Suitable willow woodlands are typically dense with well-defined vegetative strata or layers. The most critical structural component of nesting habitat in

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California is a dense shrub layer 2 to 10 feet aboveground (Goldwasser 1981; Franzreb 1989; Brown 1993). Bell's vireo is usually found along drainages or elsewhere near water, including ponded surface water or where moist soil conditions occur (Rosenberg et al. 1991), especially in arid environments (Szaro and Jakle 1982). Kus and Miner (1998) also stated the importance to least Bell's vireo of non-riparian habitats within and adjacent to floodplains for foraging and other activities. In arid environments, surface water appears to be an important element in least Bell's vireo habitat (Kus et al. 2010).

Table 1. Habitat Associations for Least Bell's Vireo

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Supporting Data
Riparian woodland	Breeding, foraging	Primary	Typically riparian woodland dominated by willow shrubs, mesquite understory, and other thick understory vegetation, including tamarisk	Goldwasser 1981; USFWS 1998; Kus et al. 2010
Riparian scrub	Breeding, foraging	Primary	Typically riparian scrub dominated by willow, mesquite understory and other thick vegetation	Goldwasser 1981; USFWS 1998; Kus et al. 2010
Mesquite Woodlands	Breeding, foraging	Primary	Historically widespread in mesquite forests , especially in riparian areas	Kus et al. 2010

Foraging Requirements

Individuals may forage in woodlands or scrub habitat near nesting habitat, concentrated in lower to mid-canopies, especially when actively nesting (Kus et al. 2010; USFWS 1998). Least Bell's vireo has shown preferences for black willow (*Salix gooddingii*) relative to its

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cover in territories (Miner 1989; Kus et al. 2010). Least Bell's vireos also forage in upland vegetation adjacent to riparian corridors particularly late in the season (Gray and Greaves 1984; Kus and Miner 1998; Salata 1983). During the winter, least Bell's vireo use willow riparian habitat, arroyo scrub vegetation, and hedgerows in coastal drainages (Kus et al. 2010).

Reproduction

Breeding least Bell's vireos begin arriving on their breeding grounds in late March and begin nesting in early April (Table 2) (Kus 2002b). Individuals may remain on the breeding grounds into early October, but nesting is typically finished by the end of July (Kus 1999). Most pairs are monogamous during the breeding season (Kus et al. 2010). Reproduction is significantly affected by brown-headed cowbird nest parasitism (see Ecological Relationships below). In addition to nest loss to parasitism, some nests fail due to other causes, including precipitation damage to nest or supporting vegetation or effects from human or animal activity, desiccation of supporting host plant, infertile or otherwise unviable eggs (Kus et al. 2010), and nest predation by a range of species including western-scrub jays (*Aphelocoma californica*), snakes, Cooper's hawk (*Accipiter cooperii*) and raccoons (*Procyon lotor*) (USFWS 1998; Kus et al. 2008).

Table 2. Key Seasonal Periods for Least Bell's vireo

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Breeding				✓	✓	✓	✓					
Migration		✓	✓	✓				✓	✓	✓		
Wintering	✓	✓								✓	✓	✓

Sources: Brown 1993; Kus 1999, 2002b.

Spatial Behavior

Little is known about the migratory routes of this species (Table 3). Most individuals have left the United States by early October (Brown 1993). During spring migration, adults return to their breeding grounds in mid-March to mid-April (Brown 1993; Kus et al. 2010). In California and Arizona, males arrive on breeding areas 1 to 2 weeks before

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females (Kus et al. 2010). The species' migratory behavior is poorly known, although it is thought to be chiefly a nocturnal migrant. Home range and movement during the breeding season is limited to areas within dense riparian corridors. Territories are often linear in nature, following the stream course.

Table 3. Movement Distances for Least Bell's Vireo

Type	Distance/Area	Location of Study	Citation
Home Range	0.6 to 0.9 ha	California	Newman 1992
	0.5 to 4 acres (0.2 to 1.6 ha)	California	Gray and Greaves 1984
	0.7 ha	California	Collins et al. 1989
	0.7 to 1.1 ha	California	Kus 1991, 1992, 1993
Dispersal	33 feet on day 1 to 330 feet on day 5	Indiana	Hensley 1950
	100 to 200 feet on day 14		Nolan 1960
Migration	From breeding grounds in U.S. and overwinters in southern Baja California and northwestern Mexico	California and Arizona	Kus et al. 2010

Ecological Relationships

For breeding, this species is dependent on dense riparian corridors, typically along watercourses. Scrub habitats adjacent to these watercourses are also important to the success of the species because they provide foraging opportunities as well as protection for nesting habitat.

Brown-headed cowbirds have decimated least Bell's vireo populations throughout its breeding range through nest parasitism. Dense riparian breeding habitat that is surrounded by agricultural lands or developed areas could facilitate brown-headed cowbird abundance and lower the breeding success of riparian nesting species such as the least Bell's vireo.

In California, more than a third of least Bell's vireo nests from the late 1920s through the 1980s contained cowbird eggs (Goldwasser et al. 1980). Since widespread implementation of cowbird trapping, over

the last 25 years, parasitism rates have dropped substantially and Bell's vireo nesting success has increased dramatically (see Conservation and Management Activities) (Griffith and Griffith 2000; Kus 1999; Kus and Whitfield 2005).

Cowbirds typically parasitize vireo nests during the egg-laying period and female cowbirds often remove or destroy vireo eggs. Adult Bell's vireos will attack female cowbirds to defend their nests (Mumford 1952; Budnik et al. 2002; Sharp and Kus 2004). In some instances Bell's vireo will abandon nests parasitized by cowbirds. A study in California showed that vireos continued to incubate 3 of 3 videotaped nests in which cowbirds laid eggs (Sharp and Kus 2004).

Population Status and Trends

Global: Declining (Kus 2002b; NatureServe 2005; Kus et al. 2010)

State: Recent evidence of range extensions and population increase (USFWS 2006)

Within Study Area: Unknown, may be increasing

Least Bell's vireo was described as common or abundant in the late 1800s and early 1900s (USFWS 1998). In California, the precipitous decline in numbers has been due to loss and degradation of riparian habitat, and the expansion in range of the brown-headed cowbird (USFWS 1998).

By 1986, the least Bell's vireo population had declined to an estimated 300 pairs, with the majority occurring in San Diego County (USFWS 1998; Kus 2002a). In 2006, the statewide population in California numbered approximately 3,000 territorial males (U.S. Fish and Wildlife Service 2006).

The USFWS records show a tenfold increase in the least Bell's vireo population since its listing under the federal ESA in 1986, from 291 to 2,968 known territories, with "tremendous" growth of the vireo populations in specific areas in San Diego and Riverside counties and lower but still significant growth in Orange, Ventura, San Bernardino, and Los Angeles counties (USFWS 2006). However, there have been significant declines in least Bell's vireo populations in Santa Barbara County since its original listing, while Kern, Monterey, San Benito, and

Stanislaus Counties have not supported any sustained populations (USFWS 2006).

Threats and Environmental Stressors

Historic loss of riparian habitat associated with agricultural practices, urbanization, and exotic plant invasion has contributed to decline of the species (USFWS 2006). Loss of breeding habitat due to water source alteration (e.g., flood control and channelization), urbanization, and livestock grazing also threatens the species. In addition, nest parasitism by the brown-headed cowbird has greatly reduced nest success throughout most of its breeding range and has been suggested as a primary cause for decline throughout California. A recent study found that vireo productivity increased by one young for each 30% decrease in nest parasitism (Kus and Whitfield 2005). An increase in cowbird abundance is propagated by particular land-use practices (e.g., residential development, agriculture, grazing) on lands adjacent to breeding habitats (Kus 1999; NatureServe 2005). In urbanized areas, where habitat is fragmented and breeding habitat lacks buffers, nest predation may also increase due to meso-predator release and the addition of non-native predators such as domestic or feral cats (USFWS 2006). The exotic Argentine ant (*Linepithema humile*) also has been noted as a nest predator (Peterson et al. 2004).

Other threats to this species' habitat include urban and suburban development on floodplains, the presence of large areas of invasive plants, such as tamarisk and giant reed (*Arundo donax*), and off-road vehicular activity (Wildlife Action Plan Team 2006). Also, flood control projects and grazing have destroyed much of the western nesting habitat (NatureServe 2010).

Conservation and Management Activities

Near the Plan Area, the least Bell's vireo is covered by the Coachella Valley Multiple Species Habitat Conservation Plan (MSHCP), which aims to conserve habitat of covered species. One of the goals of the Coachella Valley MSHCP is to ensure species persistence in the Plan Area by protecting and managing riparian habitat, controlling invasive plants, such as tamarisk, and controlling brown-headed cowbird populations, when necessary. The MSHCP will protect and manage in

perpetuity 1,282 acres of modeled breeding habitat and 19,301 acres of migratory habitat. The plan will also establish 44 acres of Sonoran cottonwood-willow riparian forest.

Various integrated natural resource management plans (INRMPs), developed as part of compliance under the Sikes Act Improvement Act of 1977, have successfully contributed to vireo conservation, including the 2001 INRMP for Camp Pendleton, which includes management actions such as cowbird trapping, which has improved population numbers in the short-term (USFWS 2006).

Bell's vireo is included in the Partners in Flight North American Landbird Conservation Plan (Rich et al. 2004), where it is designated as a Watch List species that warrants immediate action. Additionally, the species is on the USFWS list of Birds of Conservation Concern 2008 (USFWS 2008).

Throughout California, the listing of least Bell's vireo prompted protection of existing habitat, creation and planting of riparian habitat, the restoration of degraded habitat, largely through the removal of invasive exotic species such as giant reed, and widespread cowbird control through annual trapping of cowbirds from riparian habitats and nest manipulation to remove cowbird eggs from vireo nests (Beezely and Rieger 1987; U.S. Fish and Wildlife Service 1998; Griffith and Griffith 2000; Kus 2011). Relocation of feedlots, dairies, and stables away from riparian areas, and reduction of grazing in riparian areas is also recommended (USFWS 1998).

Reintroduction of Bell's vireos to areas within their historical California range has been considered but not done (Franzreb 1989). Sharp and Kus (2006) propose managing for dense understory vegetation, particularly willows, to reduce parasitism risk for nesting vireos.

Data Characterization

In general, there is a good deal of information regarding least Bell's vireo in the Plan Area. However, least Bell's vireo is highly mobile and can occur unexpectedly in new areas far from known breeding areas. Particularly, given that the species' range is expanding and population numbers are growing, continued survey work that seeks to document species presence over time is necessary.

Management and Monitoring Considerations

Bell's vireo is dependent on riparian vegetation, so management actions that improve riparian habitat will likely benefit the species. Cowbird control has been shown effective in reducing parasitism and increasing nest success throughout the vireo's range (Kus 1999, 2002b; Griffith and Griffith 2000; Morrison and Averill-Murray 2002; Kus and Whitfield 2005; Kosciuch and Sandercock 2008). A 2-year study in the Colorado River Valley of Arizona, showed that the parasitism rate and incidence of multiple cowbird eggs were significantly higher on untrapped reference plots than on treatment (trapped) plots, while success rate of nests was higher in treated plots than in the reference plots (Morrison and Averill-Murray 2002). However, Kus and Whitfield (2005) warn of using cowbird control as a long-term management tool as it makes the species' success dependent on human intervention.

Kus and Whitfield (2005) recommend practices emphasizing habitat restoration and the maintenance of natural processes on which the species depend. For example, removal of tamarisk from existing riparian areas (if replaced by native riparian habitat) would enhance habitat for least Bell's vireo and other riparian birds. Large-scale efforts to remove giant reed from drainages, such as those along the Santa Margarita River (Lawson et al. 2005) and Santa Ana River in southern California have been successful in facilitating re-establishment of native vegetation and subsequent colonization by least Bell's Vireo (SAWA 2013).

Species Modeled Habitat Distribution

This section provides the results of habitat modeling for least Bell's vireo, using available spatial information and occurrence information, as appropriate. For this reason, the term "modeled suitable habitat" is used in this section to distinguish modeled habitat from the habitat information provided in Habitat Requirements, which may include additional habitat and/or microhabitat factors that are important for species occupation, but for which information is not available for habitat modeling.

There are 298,231 acres for least Bell's vireo in the Plan Area. Appendix C includes figures showing the modeled suitable habitat in the Plan Area.

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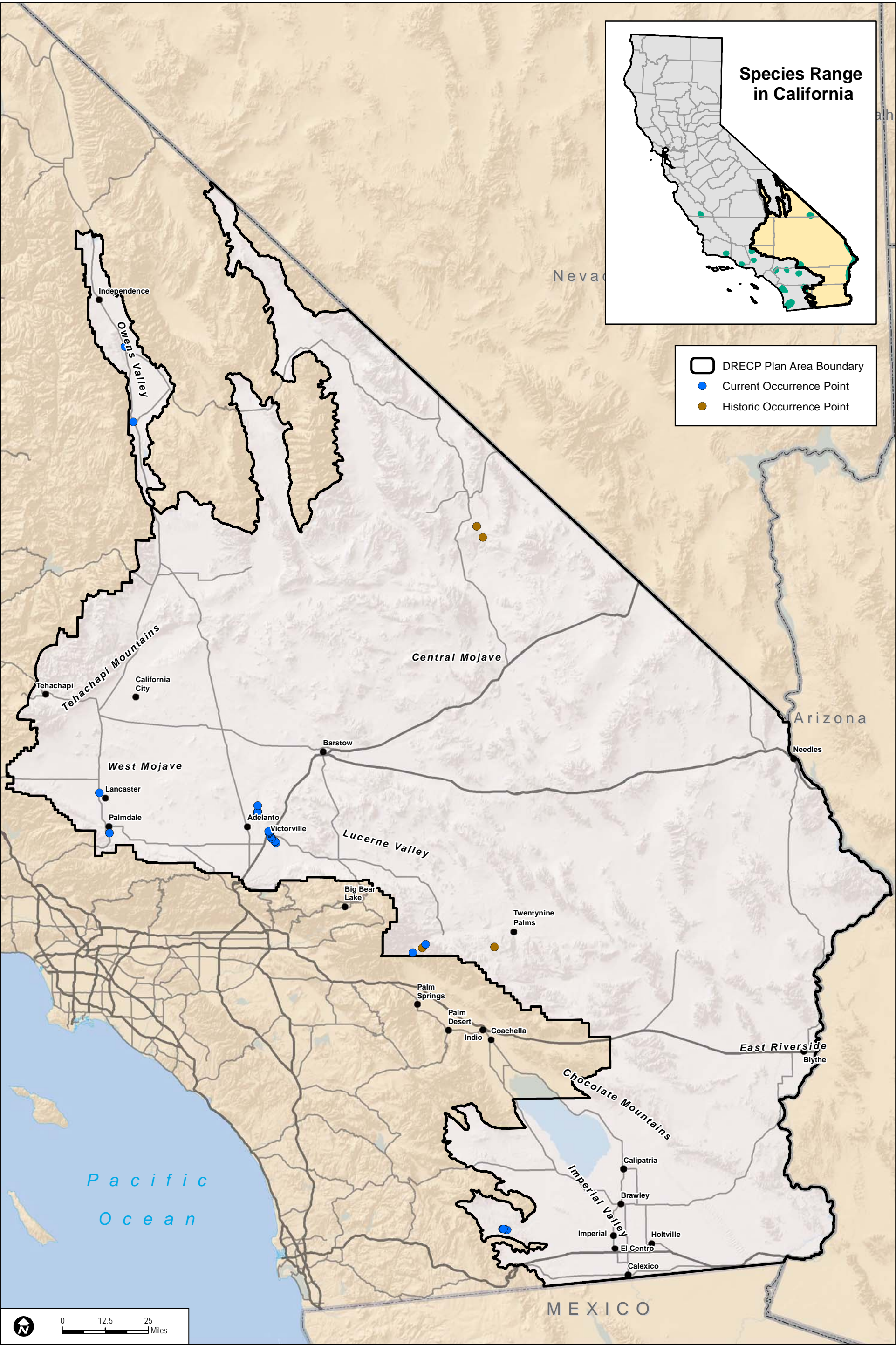
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Sources: ESRI (2014); DRECP Species Occurrence Database (2013), CWHR (2008)

FIGURE SP-B01

Least Bell's Vireo Occurrences in the Plan Area

Desert Renewable Energy Conservation Plan (DRECP) Baseline Biology Report

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